



# **HAYDITE**

**LIGHTWEIGHT  
AGGREGATE**

**for**

**Structural, Insulating Fill,  
and Refractory Concrete**

**Haydite Insulation Units**

**HYDRAULIC-PRESS BRICK COMPANY**

**ST. LOUIS, MISSOURI**

**SOUTH PARK, OHIO**

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## STRUCTURAL HAYDITE AGGREGATE

### What is Haydite?

HAYDITE is a manufactured lightweight aggregate produced by expansively burning shale or clay.

By the use of Haydite aggregate, concrete fully one-third lighter in weight than ordinary concrete can be produced.

### PREFACE

Haydite aggregate concrete also has other physical properties such as resistance to water absorption.

This booklet is not developed to give technical data, but is meant for a general description of Haydite aggregate and some of its outstanding qualities, as well as its various uses.

In general Haydite reduces the dead load over ordinary concrete by 33⅓%, and at the same time gives comparable strengths in structural concrete mixes. In floor and roof fills, it produces a lightweight concrete of high insulation value, with lean mixes, which produce high strength and exceptionally lightweight concrete.

For the same raw material, this clay or shale can be used for the manufacture of high grade brick. After being taken from the bank or quarry, the raw material is reduced to a proper fineness, and then introduced into a rotary kiln of substantially the same type used for the manufacture of Portland cement. Here the material is expansively burned at a temperature in excess of 2000° F., discharges from the kiln in the form of

## PREFACE

This booklet is not developed to give technical data but is meant for a general description of the various types of concrete and some of its characteristics.

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In general, concrete is a mixture of sand, gravel, and cement. It is a very strong material and is used in many different ways. It is used for building foundations, walls, floors, and roofs. It is also used for making bridges, dams, and other large structures. Concrete is a very durable material and can last for many years. It is also a very fire-resistant material. Concrete is a very important material in the building industry.



## **STRUCTURAL HAYDITE AGGREGATE**

### **What Is Haydite?**

HAYDITE is a manufactured lightweight aggregate produced by expansively burning shale or clay.

By the use of Haydite aggregate, concrete fully one-third lighter in weight than natural concrete can be produced.

Haydite aggregate concrete also has other physical properties such as resistance to wear, fireproofing and behavior under severe atmospheric conditions superior to natural aggregate concrete.

### **Not A By-Product**

HAYDITE AGGREGATE is manufactured from strictly high-grade clays, and shales, burned to incipient fusion, under accurate scientific control, producing a lightweight, hard, vitreous, cellular material.

### **How Is Haydite Made?**

HAYDITE is produced from the same raw materials (clay or shale) as are used for the manufacture of high grade brick. After being taken from the bank or quarry, the raw material is reduced to a proper fineness, and then introduced into a rotary kiln of substantially the same type used for the manufacture of Portland cement. Here the material is expansively burned at a temperature in excess of 2000° F., discharges from the kiln in the form of



## **STRUCTURAL HAYDITE AGGREGATE**

clinker. The clinker is allowed to cool, crushed, screened and graded to the various aggregate sizes. Haydite clinker, after being discharged from the kiln, is stored for sufficient length of time to allow it to cool slowly and become properly annealed, which produces a tough, cellular, lightweight, clinkered material which is free from impurities.

### **Hot Material Is Not Quenched in Water As Such Practice Produces Friability of Aggregate Particles**

Haydite clinker, after the annealing, goes through a crushing and screening process, which, under scientific control, produces properly balanced gradings for various uses. Properties and gradings of Haydite aggregate remain constant under strict control maintained over its production.

### **Haydite Is Not Produced From Waste Materials**

Haydite aggregates has no ingredients that will cause disintegration of concrete. Affords the very best protection to reinforced steel.

Haydite aggregate is not porous, but is composed of small vitreous non-connecting cells. For this reason none of the cement paste is lost in filling voids in the aggregate particles, thus making all of the cement effective in producing a good workability of the mix and higher structural strength in the finished concrete.



## **STRUCTURAL HAYDITE AGGREGATE**

### **Haydite Does Not Contain Combustible Matter, Silt or Organic Substances**

Haydite aggregate contains no combustible material, and is free of silt, sulphur and other impurities which are injurious to metals. Pipes, conduits, etc., may be embedded in Haydite concrete without danger of corrosion.

Haydite aggregate has a coefficient of expansion comparable to that of Portland cement. Thus, when combined with Portland cement to produce concrete, it creates a perfect and permanent bond between the cement and aggregate.

### **Haydite Combines High Strength, Light Weight, High Insulation, Low Capillarity, High Fire Resisting, High Sound Absorbing Qualities and Low Sound Transmission**

Haydite aggregate used with the proper binder, produces best sparkproof floors, strong and durable.

### **Haydite May Be Stored in the Open**

No special precautions need be used to store Haydite aggregate in stock pile except to keep injurious matter and foreign substances away.

Haydite aggregate may be stored in the open exposed to the elements with no harmful effects; in fact, absorption of moisture by the aggregate tends to take care of the pre-wetting.

## **HAYDITE STRUCTURAL CONCRETE**

### **Haydite Structural Concrete**

Haydite concrete is light in weight and has higher compression and tensile strengths than other lightweight concrete with same cement content.

Haydite concrete has low capillarity, and in the proper mixes is practically impermeable to moisture.

Haydite concrete has higher insulation value than any other lightweight concrete of comparable structural strength. Its insulation is comparable to materials of much lower structural value and much higher cost.

### **Pre-Wetting Haydite Aggregate**

The effective absorption of Haydite aggregate should occur before the cement is added to the mixture; therefore it is advisable to thoroughly wet the Haydite aggregate in the pile. Haydite aggregate in the pile should contain at least 10% moisture.

If pre-wetting of Haydite aggregate in the stock pile is impracticable, Haydite concrete may be mixed in the following manner: add Haydite to mixer plus two-thirds of the calculated mixing water—allow to mix at least one minute—add cement plus remaining mixing water and mix at least two more minutes.



## HAYDITE STRUCTURAL CONCRETE

### Mixtures

The proper mixture of Haydite aggregate, cement and water ratio, depends on the strength, weight and workability that is required.

For example, using 6 sacks of cement per cubic yard of concrete in place (absorption of aggregate having been taken care of prior to mixing) use 6 to 8 gallons of water per sack of cement, for concrete of 2,000 to 2,500 Lbs., per square inch compression strength, weight 90 to 100 Lbs. per Cu. Ft. If higher cement content is used, the water-cement ratio should be reduced to the point where the proper consistency (a homogenous mass) is obtained for work for which it is to be used. If efficient mechanical or electrical vibration is used, the water can be reduced, yielding a corresponding increase in strength.

For roof fill, floor fill, of lean mixtures, the water content per sack of cement should be increased to meet requirements of job, but in no case should water be added to such an extent as to cause separation of cement and aggregate.

Your source of supply for Haydite aggregate should be consulted regarding the proper mixture that should be used to obtain concrete of the proper type, to meet the requirements of the job.



## HAYDITE STRUCTURAL CONCRETE

### Curing Haydite Concrete

In general, curing of poured Haydite concrete should follow the same lines as that of ordinary concrete. However, it must be remembered that Haydite, having good insulating qualities will dry out much more slowly than ordinary concrete. The surface will dry out much faster than the interior, and for this reason it is recommended that the surface of structural Haydite concrete be kept moist for as long as practically possible.

### Effect of Increased Water Content On Concrete Mixes

The water cement ratio law states that within the limits of workability, the ratio of the water content to the cement content of concrete mixes is the deciding factor regarding the concrete strength and durability. The higher the water content, the lower the strength. Experiments have proven that in correctly proportioning the aggregates the volume of water necessary to produce a workable concrete was reduced to a minimum and therefore, gave strength in excess of that produced by merely arbitrary proportions. Professor Duff Abrams in an attempt to devise a more workable method of proportioning discovered his "Water-Cement Ratio Law."

The hundreds of thousands of tests conducted by which the water-cement ratio law was established and the confirmation of that law by the millions



## HAYDITE STRUCTURAL CONCRETE

of cubic yards of concrete poured since its acceptance confirm beyond doubt that the **deciding factor of concrete strength** is the **ratio** of the mixing water to the cement. This holds true only so long as the mixture is plastic and workable.

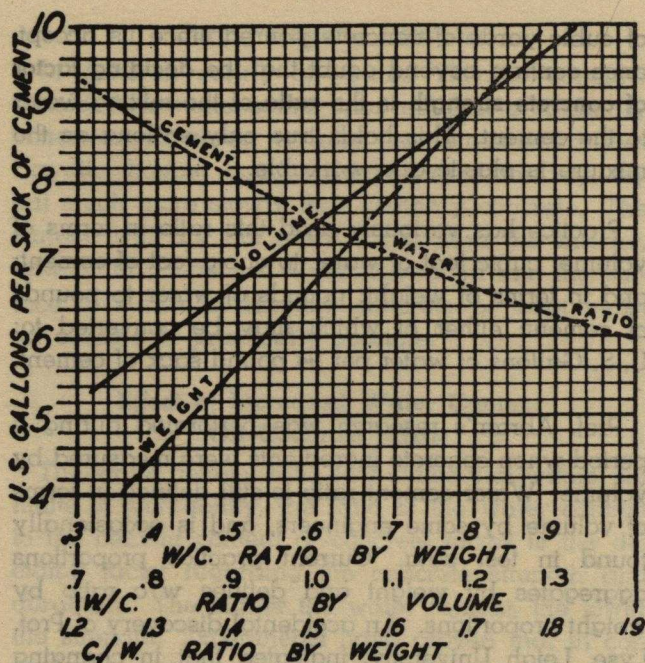
Practice has variously used this ratio in terms of volume: cubic foot of water to cubic foot of cement; and in terms of weight: pounds of water to pounds of cement; either of which may be converted to: U. S. Gallons of water per 94 pound sack of cement.

Prof. Abram's research was performed during a period when concrete ingredients were measured by volume. Water cement ratio is still defined in terms of volume by some engineers, and is occasionally found in test data. Current practice proportions aggregates by weight and defines w/c ratio by weight proportions. An accidental discovery of Prof. Lyse, Leigh University, indicated that in changing the relation w/c to c/w in terms of weight, the strength value of concrete as an equation expressed in terms of an exponential variable plots as a straight line.

In dealing with concrete mix design, particularly in the comparison of various test data, there is need of a ready means of conversion of the three methods of expression. Comparative values reflecting the three ratios in terms of U. S. Gallons of water per sack of cement are shown in the following chart:



# HAYDITE STRUCTURAL CONCRETE



The Haydite aggregates produced at the various plants are similar in their general characteristics but are variable in gradings, weights and color. The aggregates from all the plants produce a concrete with the same general properties.

## Sizes of Haydite Aggregate (Standard Gradings)

"A" Grade, or sand size ( $\frac{1}{4}$ " to 0") used as fine aggregate in general concrete construction and concrete products.



## **HAYDITE STRUCTURAL CONCRETE**

"B" Grade, or coarse Size ( $\frac{1}{2}$ " to  $\frac{1}{4}$ ") used as coarse aggregate in general concrete construction.

"BX" Grade, Combined ( $\frac{1}{2}$ " to 0") which is equivalent to equal parts of "A" and "B" Grade Sizes. For lightweight structural concrete, precast products and lightweight floor and roof fills, with high insulation value. The mixes, depending on strength and density required, range from 1-part cement to 14-parts aggregate down to 1-part cement to 6-parts aggregate, compressive strengths (28 days) ranging from 300 to 1200 pounds/Sq. Inch, and "K" Value Thermal Conductivity 1.30 to 2.02.

Special gradings of aggregate to meet certain requirements can be furnished on request. Contact your nearest source of supply.

## **HYDRAULIC-PRESS BRICK COMPANY**

**St. Louis, Mo.**

**South Park, Ohio**

### **What Is the Meaning of "K" Factor?**

The "K" Factor is the heat loss expressed in B.T.U.'s through any given material. It is the flow of heat expressed in B.T.U.'s per hour per Sq. Ft., inch thickness per degree of temperature differential Fahrenheit.

More specifically, if Haydite concrete with a density of 74 Lb./Cu. Ft., is one inch thick, one square foot in area, and the temperature difference between one side of the inch thick Haydite slab is one degree,



## HAYDITE STRUCTURAL CONCRETE

the flow of heat through that Haydite slab will be 1.82 B.T.U.'s per hour. (Authority for this figure-tests by The Thompson & Lichtner Co., Inc., Engineers, Boston, Mass., and Professor J. C. Peebles, Armour Institute, Chicago.)

### What Is The "K" Factor of Haydite Concrete Compared to Ordinary Concrete?

The coefficient of heat conductivity for Haydite concrete of 74 Lb. density has been established by The Thompson & Lichtner Co., Inc., Engineers, at 1.82 B.T.U.'s per hour, per square foot, per inch thickness, per degree of temperature differential, and a similar test by the University of Toronto gives a coefficient for 90 pound of Haydite concrete of 2.24 B.T.U.'s.

The "K" factor of Sand and Gravel concrete—weight 150 pounds per cubic foot is 12.

### Recognized Coefficients of Masonry Materials

	Per Cubic Foot
Haydite Structural Concrete 94Lb. to 100Lb.	K= 3.98
Common Brick Backup 120 Lb. to 125 Lb.	K= 5.00
Face Brick 120 Lb. to 125 Lb.	K= 9.20
Stone, Slate, Marble 150 Lb. to 160 Lb.	K=12.50

Note substantial difference in favor of Haydite.



## **REFRACTORY HAYDITE AGGREGATE**

Haydite BX-4.00 Refractory Aggregate is produced under more rigid specifications than those for structural aggregate and is specifically prepared for refractory work.

Haydite BX-4.00 Refractory Aggregate will vary but slightly from the Fineness Modulus of 4.00. The moisture content is controlled in shipping being limited to 4%.

Fineness Modulus is the total of the accumulative percentages of material retained on standard concrete aggregate screens up to and including 100 mesh divided by 100.

### **Difference Between Refractory and Structural Haydite**

Haydite Lightweight Haydite Aggregate is an inert, expanded product made by burning clay or shale in a rotary kiln. The clinker thus formed is crushed and screened to produce a uniform, properly graded lightweight aggregate which, combined with Lumnite cement and water in definite proportions, forms an hydraulic bond. The resultant product has high resistance to crushing loads which actually increases after the transformation from hydraulic to ceramic bond which is accomplished upon subjection to maintained temperatures ranging from 1500° to 2000° Fahrenheit.



## REFRACTORY HAYDITE AGGREGATE

### Necessary Precaution With Use Of Lumnite Cement

**MIXING:** First moisten the aggregate until it will not readily absorb any more water, then add the Lumnite and mix to a uniform color. Add sufficient cool water (not over 80° F.,) to make the mixture plastic, soft and sticky. If the aggregate contains sufficient fines and dust the mix will be plastic, easily placed by spading without ramming, and will not release free water. If the aggregate contains insufficient fines and dust to produce this consistency, the addition of small percentages of plastic fire clay will increase the plasticity.

### Curing

In curing, the best results are obtained if the exposed surface of the concrete is kept moist by sprinkling from six hours after mixing until twenty hours after mixing. This is of particular importance when dense aggregates are used, or the work is done in a place where high atmospheric temperatures prevail or where the air is very dry.

When lower temperature ranges prevail and not in excess of 1200° Fahrenheit, economy in first cost may be had by substituting Portland for Lumnite cement.

### Haydite Refractory Concrete Resists Thermal Shock

Haydite refractory concrete resists thermal shock



## REFRACTORY HAYDITE AGGREGATE

because of the low coefficient of expansion of Haydite refractory concrete plus the fact that both the cement and the aggregate have approximately the same thermal expansion factor.

### Quotations

Quotations on Haydite aggregates for structural concrete are based on cubic yard measurement and for shipment in bulk, loaded in open top flat bottom, drop bottom, or hopper bottom gondola cars, whichever type of railway equipment unloading facilities require, or truckload delivery in limited area. The weight per cubic yard of Haydite aggregate varies from about 1200 to 1600 pounds depending on the grading and locality of source of supply.

Quotation on BX-4.00 Refractory Haydite aggregate are not based on bulk shipment.

BX-4.00 Refractory Haydite aggregate is packed in specially prepared paper lined burlap water-proof sacks, or 5-ply paper bags of 2-Cu. Ft. content and quotations are based on less than carload or truck shipment, or in carload shipment in box car railway equipment.

For further details contact —

### HYDRAULIC-PRESS BRICK COMPANY

St. Louis, Missouri  
Cen't Nat'l Bank Bldg.  
Phone CH. 9533

South Park, Ohio  
Cleveland Phone  
ML. 5656



## **HAYDITE INSULATION UNITS**

### **Heat Proof:      Sound Proof:      Fire Proof:**

Light Gray in color. Pleasing and restful to the eye.

### **Light in Weight:**

The lightest structural masonry wall in use today.  
About half the weight of concrete blocks.  
Wall weights are reduced 60% over brick.  
Masons can lay more wall per day with less labor.

### **Haydite Insulation Units**

May be easily furrowed or channeled in the wall without breakage or damage.

### **Naillable and Termite Proof**

Afford the very best base for application of plaster stucco or any satisfactory water-proofing material.

### **Highest Insulation Value:**

Has highest insulation value against cold, heat, moisture or sound.

35% less heat lost through a 12-inch wall using 4" of brick and 8" of Haydite backup than one using 4" of brick and 8" tile backup.

A material that is more than just backup, and costing little or no more than tile or brick backup.

### **Acoustic Properties:**

Haydite partition units have the highest sound reduction value of the five leading types of partition materials, such as hollow clay, gypsum tile, plaster on metal lathe, and plaster on wood lathe and wood studs. Absorb sound equal to acoustical plaster.



## HAYDITE INSULATION UNITS

### Lowest Capillarity:

Moisture will not be conducted through the block.

### No Combustible Matter:

### No Sulphur:

Nothing present that will corrode steel, stain plaster, or discolor paint.

"C" factor of 8" Haydite Unit = .30

"C" factor of 8" Concrete Block = 1.00

70% less heat loss through use of Haydite Units as compared to ordinary Concrete Blocks.

### Comparison of Wall Thickness

HAYDITE INSULATION UNITS vs. OTHER MASONRY MATERIALS, which based on authentic tests are all equal in heat transfer.

Haydite Units	8"	Wall
Clay Tile (1-10", 1-6")	16"	"
Brick and Tile (4" Brick, 12" Tile)	16"	"
Solid Brick	18"	"
Ordinary Concrete Blocks	28"	"
Poured Concrete (Nat. Aggr.)	40"	"
Solid Stone Masonry	41½"	"

Note the decided advantage in the use of Haydite Insulation Units.

Haydite Insulation Units are produced in all standard sizes and shapes, and can be quickly and economically produced in special shapes.

An average of 8x8x16-Inch Haydite Insulation Unit with 45% core space weighs approximately 26 pounds and has a compression strength of 1000 pounds per square inch, gross area.

## **HAYDITE INSULATION UNITS**

On the above basis, these units piled one upon another, with mortar joint between each unit, until the lower unit fails in compression, it would require 3,760 units in height, or 2,500 feet high.

### **Haydite Insulation Units For Exterior Facing**

For economy and distinct beauty Portland cement can be applied directly to the unit.

Exposed interior unit walls are used in churches, auditoriums, theatres, and bowling alleys, to reduce sound vibration.

## **HAYDITE INSULATION UNITS COMBINE**

**LIGHT WEIGHT**

**HIGH STRENGTH**

**HIGH INSULATION VALUE**

**FIRE RESISTING QUALITY**

**LOW SOUND TRANSMISSION**

**HIGH SOUND ABSORBING QUALITY**

\* \* \*

**HAYDITE INSULATION UNIT PRODUCERS** will be glad to give you further details.

**Or Contact**

**HYDRAULIC-PRESS BRICK COMPANY**

**St. Louis, Mo.**

**South Park, Ohio**



# JJ-815

## Insulating Fire Brick

Composed of Haydite AX-3.25FM Refractory Aggregate and binder, embodying the entirely new and revolutionary principle of Double Porosity.

Insulating properties of JJ-815 Insulating Fire Brick are equal to and in some instances superior to higher priced insulating fire brick.

Much stronger than any other insulating brick of lighter weight and will not crack under load.

Maximum Service Temperature direct

Exposure ..... 2000°

Modulus of Rupture (Traverse Strength—

200 Lbs./Sq. In.

Cold Crushing Strength..... 800 Lbs./Sq. In.

Reheat Shrinkage 24 hrs. 1900° F..... No change

Weight per 9" brick..... 3.5

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For further particulars contact

**HYDRAULIC-PRESS BRICK COMPANY**

Central National Bank Bldg.

Saint Louis, Missouri

11-815

## Insulating Fire Brick

Composed of Havydite AX-325FM Refractory Aggregate and binder, embodying the entirely new and revolutionary principle of Double Porosity.

Insulating properties of 11-815 Insulating Fire Brick are equal to and in some instances superior to higher priced insulating fire brick.

Much stronger than any other insulating brick of lighter weight and will not crack under load.

Maximum Service Temperature—  
Exposure 3000°

Modulus of Rupture (Transverse Strength)—  
200 lbs./sq. in.

Cold Crushing Strength—  
800 lbs./sq. in.

Reheat Shrinkage 24 hrs. 1900° F.—No change

Weight per sq. ft. thick—3.5

For further particulars contact

HYDRAULIC PRESS BRICK COMPANY

General National Bank Bldg. 11th & Broadway

St. Louis, Missouri



